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Connecting the Unobserved Dots:

A Decomposition Analysis of Changes in Earnings Inequality in Urban Argentina, 1980-2002

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Abstract

There are several possible explanations for the observed changes in inequality, the returns to education, and the gap between the wages of informal and formal salaried workers in Argentina over the period 1980-2002. Largely due to the lack of evidence for competing explanations, skill-biased technical change is the most likely explanation for the increases in the returns to education that occurred in the 1990s. Using a semi-parametric re-weighting variance decomposition technique and data from the Permanent Household Survey, the authors show that during the same period there was an increase in the returns to unobserved skill. This finding lends support to the hypothesis that skill-biased technical change has been a main driver of increases in inequality in Argentina. The pattern of changes suggests that the growth in returns to unobserved skill may have been partly responsible for the relative deterioration of informal salaried wages during the 1990s

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Connecting the Unobserved Dots: A Decomposition Analysis of Changes in Earnings Inequality in Urban Argentina, 1980-2002

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1. Introduction

Earnings inequality in Argentina decreased during the 1980s and then rose during the 1990s. During the 1990s, the rise in inequality was partially driven by increases in the returns to education. Candidate explanations for the increase in the returns to education include trade-related changes in production, changes in institutions like the minimum wage and union membership, and skill-biased technical change (SBTC). Available evidence suggests that the first two candidate explanations do not appear to have driven changes in returns to education, leaving skill-biased technical change as the most likely cause. We examine the Argentina case for changes in the returns to unobserved skill by decomposing the variance of earnings over time. The decomposition shows that the residual wage variance increased in Argentina in the 1990s. Under plausible assumptions, this implies that the returns to unobserved skill have risen. Following on similar analysis done for the United States, we interpret the increase in the returns to unobserved skill as evidence for skill-biased technical change.

To decompose changes in the variance of earnings, we employ Lemieux's semi-parametric re-weighting technique. The method accounts for a change in the composition of observable workers' characteristics over time, allowing us to estimate a counterfactual wage distribution which holds initial population characteristics constant over time. The change in the overall variance of wages can be decomposed into changes due to changes in characteristics, changes in the returns, and changes in the returns to unobserved skill.

The change in the returns to unobserved skill also has the potential to explain a puzzle regarding informal labor in Argentina. Argentina has seen a long-run shift from formal to informal wage employment. During the 1990s rates of informal salaried employment increased while at the same the wages of informal workers, relative to formal workers fell. The growing gap in wages between formal and informal workers is not explained by the rising returns to education. The growing gap may be driven, however, by changes in the demand for unobserved skills driven by SBTC. If employers observe these skills, there will be less demand for workers without them. Skilled workers may thus be hired into formal jobs, which would consistently explain the increase in informality as well as the increasing informal-formal wage gap.

We find that the returns to unobserved skill have increased particularly in terms of the gap between the median and those at the bottom of the distribution, where informal salaried

workers are concentrated. This is compatible with the idea that an increase in the returns to unobserved skill has been responsible for the increased gap between formal and informal wages.

The structure of the paper is as follows. Section 2 provides an overview of the Argentine context in terms of broad economic background, earnings inequality, and the evolution of returns to education. We discuss several possible explanations for the observed empirical series in section 3: changes in the minimum wage, trade liberalization and skill-biased technological change. Section 4 discusses the theoretical foundation of the classical Mincer wage determination model, how between- and within-group wage inequality can be computed from this model, and how to correct for workforce composition effects over time. The use and assumptions of a semi-parametric decomposition method proposed by Lemieux (2002) are discussed. Section 5 describes the data. Section 6 presents the decomposition of wage variance over time, and Section 7 discusses the possible relationship to informality. Section 8 concludes the paper.

2. Overview of Earnings Inequality and the Distribution and Remuneration of Skills in Argentina

Argentina has seen pronounced economic cycles in recent decades. The 1980s were characterized by mostly weak economic performance in Argentina. An economic crisis in 1981-82 was followed by a short recovery, and then a new crisis in 1985. In the late 1980s, Argentina was again marked by an economic crisis and then hyperinflation. A new stabilization plan was initiated and a fixed exchange rate was implemented in April 1991. The currency board was paired with a strategy of trade liberalization, deregulation and privatization, resulting in a stable economy for most of the 1990s. Signs of renewed crisis were felt by the end of the 1990s when the Argentina's public debt had mounted to unsustainable heights. International financial markets put huge pressure onto the Argentine currency, culminating in the abolishment of the currency board in January 2002. Since 2003, the Argentine economy has been recovering.

In terms of earnings inequality, the 1980s and the 1990s are two distinct episodes (see Figure 1). The first half of the 1980s in Argentina was characterized by falling earnings inequality. Between 1980 and 1986 the ratio of the 90^{th} to the 10^{th} percentile of the earnings distribution

fell from 5.5 to 5.2 for men and from 5.1 to 4.5 for women. Following the late 80s period of high inflation, during which measured wage inequality jumped temporarily (due to increased measurement error), wage inequality in 1992 was slightly lower than in 1986. Then, between 1992 and 2002, wage inequality increased sharply; the 90:10 ratio jumped from 5.0 to 7.9 for men and from 4.1 to 7.4 for women.

The changes in earnings inequality are in part driven by changes in the levels and of skills and their returns.[1] As Table 1 shows, the returns to higher education decreased during the 1980s and increased in the 1990s.[2] The returns of completed high school education compared to primary education for men were 0.64 in 1980, dropping 0.45 in 1992, and rising to 0.56 in 2002. For women, the marginal returns of high school education were 0.59 in 1980, 0.37 in 1992, and 0.72 in 2002.

The returns to college fell for women and grew slightly for men during the 1980s and then increased strongly in the 1990s. The returns to a completed college education compared to a completed high school education were 0.59 for men in 1980, 0.66 in 1992, and 1.03 in 2002. For women the returns of college education were 0.53 in 1980, falling to 0.38 in 1992 and rising to 0.79 in 2002.

The distribution of educational attainment in the labor force has also changed,. Overall, there was a steady educational upgrading in the population, as shown in Table 2. Between 1980 and 2002, the fraction of full-time workers with a high school or college degree of each gender doubled, going from 23 to 48 percent for men and from 34 to 66 percent for women.

The returns to labor market experience have also evolved, but with diverging patterns for men and women. As Table 3 shows, the returns to experience fell for men between 1980 and 1992, and then rose back to 1980 levels by 2002. The return to experience evaluated at 20 years was 0.77 in 1980, fell to 0.69 in 1992 and rose back to 0.77 in 2002. In contrast, returns to

[1] The coefficients of educational variables estimated in standard Mincer wage regressions are potentially biased due to omitted human capital variables such as ability which may be correlated with education. The problem is widely accepted and one must be cautious about strong inferences about the causal effects of education. Still, it has become common to refer to the education coefficient in any statistical earnings model as the "return to education". (Card 1999) An extended discussion on the causality of education on earnings is beyond the scope of this paper. For a more detailed analysis of changes in the returns to education in Argentina, see Giovagnoli, Fiszbein, Patrinos (2005) and Margot (2001).

[2] Marginal returns to education are estimated by specifying standard Mincer wage regressions, where the dependent variable is log hourly wages from principal occupations for adult full-time workers. Regressors include educational dummies and potential labor market experience calculated as age minus years of education minus 6.

experience grew constantly for women over the two decades. Evaluated at 20 years, returns increased from 0.53 in 1980 to 0.61 in 1992 and 0.73 in 2002.[3]

Changes in the distribution of labor market experience among full-time workers are depicted in Table 4. While Argentina experiences a gradual ageing of the population, the distribution of labor market experience remains roughly constant between 1980 and 2002. This fact may be due to longer periods of education.

3. Potential Explanations for Changes in Earnings Inequality

There are several possible explanations for the rise in inequality that has taken place in Argentina in the 1990s, in particular the increase in the returns to education. Candidate explanations include institutional changes, such as changes in the minimum wage and union membership, trade-related changes in production, and skill-biased technological change (SBTC). We briefly consider whether institutional changes or trade may be responsible and then describe the evidence for SBTC in more detail.

Institutional Changes

Some have argued that the increase in wage inequality observed in the 1980s in the United States was driven largely by dramatic declines in unionization rates and the real value of the minimum wage. (See, for example, Dinardo, Fortin, and Lemieux 1996.) Although effects of unions and the minimum wage on employment could go in either direction, it is generally expected that unions and the minimum wage reduce wage inequality among the employed by boosting the wages of those in the lower part of the wage distribution.

While data on unionization rates in Argentina is not collected consistently, estimates from household surveys show that union membership among non-agricultural salaried workers in Greater Buenos Aires increased only slightly from 45 percent in the beginning of the 1980s to 49 percent in 1990. Over the next decade, it fell to 42 percent in 2001 (Marshall 2005). The relationship between union membership, policies, and labor market outcomes is complex,

[3] It is recognized that "potential labor market experience" measured as *age* minus *years of education* minus *school entry age* most likely overstates actual labor market experience more for women than for men due to child bearing and the traditional division of labor in the family. This results in estimated returns which are biased downwards. See e.g. Blau and Kahn (1997).

particularly in a country like Argentina where unions have a strong voice in political decisions. But narrowly examined, the fairly small drop in union membership is not large enough to explain the increases in wage inequality that took place in the 1990s.

Changes in minimum wage also have the potential to influence wage inequality. The real value of the minimum wage greatly eroded during the period of hyperinflation of the late 1980s and early 1990s. Because it dropped to a point below the wages of essentially all workers, the minimum wage cannot have contributed to changes in inequality between the early and late 1980s. However, it is conceivable that the minimum wage during the 1990s did have some effect. The nominal wage was increased from 97 pesos to 200 pesos in 1993 and remained there until 2003. Between 1992 and the end of the fixed exchange rate in December 2001, the minimum wage remained essentially unchanged in real terms.

As a first order effect, the increase in the minimum wage that took place in 1992 would be expected to decrease wage inequality, at least among formal salaried workers. As Maloney and Nuñez (2003) point out, the minimum wage can have complex effects on the wage distribution, beyond those on formal salaried workers near the minimum wage. In many countries, the minimum wage has both "numeraire" and "lighthouse" effects that spill over to the informal sector. The numeraire effect is the bunching of wages at round multiples of the minimum wage, due to the fact that the statutory minimum wage is often used as the numeraire for wage negotiations. The lighthouse effect refers to the concentration of informal workers (for whom the minimum wage is not enforced) at the minimum. Using 1998 EPH data, Maloney and Nuñez find strong evidence of both effects in Argentina. Likewise, Khamis (2007) examines the effects of changes in the minimum wage 1993 and 2004 on wages and finds positive effects on both formal and informal wages, with a larger effect for informal wages.

Given these effects, it is difficult to determine with certainty what the wage distribution would have looked like with a lower minimum wage. Overall, however, it seems likely that both the direct effect of the minimum wage increase and the numeraire and lighthouse effects tended to raise the wages of those in the lower part of the distribution, reducing inequality even while overall wage inequality increased.

Trade

Time trends at first glance suggest that widening inequality may be due to the trade liberalization that took place over the course of the 1990s, and a wide international literature

has considered the possible effects of trade opening on wage inequality and the returns to skill. Theory suggests that liberalization towards countries with large numbers of unskilled workers may increase the gap between wages of the skilled and unskilled. Porto (2002) shows evidence that a substantial portion of Argentine imports are substantially unskilled labor-intensive, which lends some credibility to the hypothesis that trade is behind the increase in returns to skill. Using a Computable General Equilibrium approach, Cicowiez (2003) finds that declining import tariffs increased the gap between skilled and unskilled workers only to a negligible amount, explaining between 0 and 6 percent of the change, depending on model and assumptions. A more direct test of the hypothesis is carried out by Galiani and Sanguinetti (2003) by testing whether sectors where import penetration deepened are also the sectors where a higher increase in wage inequality is observed. They find some evidence that this is the case but conclude that trade deepening can only explain a small portion of the observed rise in wage inequality.

Technological Change

Skill-biased technological change denotes the phenomenon by which relative wages may change in a country due to the adoption of new technologies. If such technologies are complementary to skills, then workers with these skills will benefit from increased productivity of these skills and consequently increased returns or compensation of these skills. The wage distribution will spread as the workers without the complementary skills are less in demand and their relative wages will fall, resulting in increased wage inequality.[4]

A line of literature for the U.S. starting with Katz and Murphy (1992) looks at SBTC in a supply and demand framework. The approach in these studies is to divide employment into various cells, e.g. by age-gender-education, and examine the relationship between changes in wages and employment by cell over time, applying assumptions about the elasticity of substitution between workers in different groups. The SBTC literature has been criticized on a number of grounds (see for example Card and DiNardo, 2005). The most substantial critique is that the effect of SBTC is always a residual out of a model-based estimation, and the estimates tend to be highly sensitive to the particular assumptions that go into the model. This is because the "facts" to be explained by the analysis are the changes in the cell means. The presence of technological change is inferred by a failure of the model to rationalize the co-movements of wages and employment for different groups over the sample period.

[4] For an extended discussion on this, see Acemoglu 2002.

Other studies apply a variance decomposition analysis over time. The objective is to split up the variance over time into its components, the variance within and between groups of the same education and experience. Changes in the returns to observed skills, such as education, change the distance between the mean wages of different population sub-groups. An increase in the returns to higher education will drive the sub-group means further away from each other, thus increasing earnings dispersion. SBTC might be the reason for such an increase in returns to education. Since very few individual skills are observed in the data, individuals with heterogeneous unobserved skills will look alike to the econometrician. If the returns to some unobserved skill change, this will be noted as changes in the earnings dispersion within sub-groups, the residual variance. With certain assumptions in the decomposition process one can infer changes in the returns to unobserved skills. People who argue for SBTC have also claimed that SBTC may also change unobserved skill returns, and that changes in these returns may be taken as indications for SBTC.

Lemieux (2006) points out the role that changes in the composition of the workforce have for the residual variance. Taking composition effects appropriately into account, he finds that an increase in returns to unobserved skill may have occurred in the 1980s but did not in the 1990s when technological progress is widely believed to have taken place. The fact that the returns to unobserved skill increase only in the 1990s for the Unites States is also incongruent with the consistent increase in the returns to education over both the 1980s and 1990s. Overall, Lemieux concludes that the pattern of changes in the returns to unobserved skill in the United States does not lend support to the SBTC hypothesis.

In the literature in the U.S. and other countries, the lack of evidence for other explanations is interpreted to imply that SBTC may be behind increases in the returns to education. The same holds true for Argentina. Several reviews suggest that changes in technology are the proximate cause of changes in returns to education in Argentina. Giovagnoli, Fiszbein, and Patrinos (2005) suggest that increased demand for skills may have driven the increasing returns to education observed in the 1990s. Analysis in World Bank (2004) also shows that the patterns observed for that decade are consistent with skill-biased technical change. Acosta and Gasparini (2007) show that the wage premium for a college education increased more in manufacturing industries with higher rates of physical investment. They also find that this premium grew more in sectors which faced strong import competition.

In an extensive analysis of labor market data from Gran Buenos Aires, Gasparini (2003) presents many pieces of evidence in favor of SBTC as an explanation for the increase in

inequality which Argentina experienced in the 1990s. He especially contrasts the economically frustrating experience of import substitution industrialization until the end of the 1980s with the significant productivity increase experienced in the 1990s through reforms and international market integration. Measures of technological progress are hard to obtain, but increases in private investment as a proportion of GDP, a fall in the average age of the capital stock, and a strong increase in the imports of capital goods are indirect evidence of the incorporation of new technologies in the Argentine economy after 1991. Given the parallelism of reforms and the immediate nature of liberalization and opening of the economy to international competition, this might be regarded a "true technological shock" to Argentina.

In this context, it becomes clear that trade and technological change may be connected. Trade opening enables the import and adoption of technology-intensive foreign capital and goods. However, when comparing the two direct channels of import penetration of goods which are abundant in the non-scarce skill and technological change, several studies, including for Argentina, underline the dominance of the technology channel (see Gasparini, 2003, Acosta and Gasparini 2004).

4. Theoretical Framework for Wage Inequality and Returns to Skill

This section presents the theoretical fundamentals of the analysis of changes in the distribution of wages, incorporating the role of changes in the distribution and remuneration of skills, such as education and experience. We follow the methodology employed by Lemieux (2006) for the United States. The approach can be considered a generalization of the Oaxaca-Blinder decomposition of means to the case of an entire distribution.

In his seminal work, Mincer (1974) laid the foundation for a vast strand of research on human capital earnings. He specified the earnings function

(1) $$\log w_{it} = \alpha_t + X_{it}\beta_t + \varepsilon_{it}$$

where w_{it} is the hourly wage rate of individual i at time t, α_t is a constant, X_{it} is a vector of observed personal characteristics, β_t is a coefficient vector, and ε_{it} is the standard regression residual. Personal characteristics usually include a person's education, either in years of

schooling or in a vector of dummies for educational attainment, and a quadratic of age or alternatively potential labor market experience. X_{it} can be understood as a distribution of human capital and β_t as its price. ε_{it} contains the unexplained portion of the wage, which is usually quite large due to the vast amount of personal characteristics that a researcher cannot observe in the data. In the literature on returns to unobserved skills, the residual is interpreted as the true residual (including measurement error) μ_{it} plus the product of the return *p* to unobserved skills at time *t* with the unobserved skill vector *e* of individual *i*:

(2) $\varepsilon_{it} = p_t e_{it} + \mu_{it}$

The variance, as a standard measure of dispersion, of wages is thus

(3) $V_t = \beta_t' \Omega_{x,t} \beta_t + \sigma_t^2$,

where $\Omega_{x,t}$ is the variance-covariance matrix of X_{it}, and σ_t^2 is the variance of the error term. Changes in the variance over time can thus be caused by several factors: (a) changes in the distribution of observed characteristics X_{it}, (b) changes in the returns to observed skills, (c) changes in the distribution of unobserved characteristics e_{it}, (d) changes in the returns to unobserved skills, or (e) changes in measurement error.

For equation (2) to have some empirical content, it is necessary to impose some assumption on the distribution of skills. Since both unobserved skill and the returns to unobserved skill are "unobserved," *some* assumption is needed. The usual assumption is that the distribution of unobserved skills among workers with the same observed skills is stable over time.[5] In other words, the *conditional* distribution function does not vary over time:

(3) $F_t(e_{it} \mid X_{it}) = F_t(e_{it} \mid X_{it})$ for all time periods *t*.[6]

Note that the stronger assumption sometimes implicitly used in the literature, which is that the *unconditional* distribution of unobserved skills is stable over time, is clearly incorrect. It is well established in both the theoretical and empirical literature that heteroskedasticity is pervasive in wage regressions, and wage dispersion increases with both education and

[5] This assumption is used in Juhn, Murphy and Pierce (1993), Chay and Lee (2000), and Lemieux (2006).
[6] As pointed out by Lemieux (2006), this assumption may be problematic e.g. if there are cohort effects: younger cohorts could have a different distribution of unobserved skills conditional on education, e.g. due to change in school quality or educational content.

experience. Consequently, changes in the composition of the workforce, i.e. in the relative size of education-experience groups, will change the unconditional distribution of unobserved skills, even with no change in the return to unobserved skills.[7]

Although the issue is sometimes ignored, it is crucial to control for composition effects when considering the changes over time in the returns to unobserved skill. The role of composition effects is illustrated by considering the variance of wages. Consider the case where observed skills, X_{it}, are divided up into *j* cells. Then, the unconditional variance of unobserved skills is the weighted sum of the conditional variances for the *j* subgroups. The weights are simply the shares, θ_{jt}, of workers in experience-education group *j* at time *t*:

$$(4) \qquad Var(e_{it}) = \sum_j \theta_{jt} Var(e_{it} \mid j).$$

Give the assumption that the conditional variances are stable over time, this equation can be written as follows:

$$(5) \qquad Var(e_{it}) = \sum_j \theta_{jt} \sigma_j^2,$$

where $Var(e_{it} \mid j) = \sigma_j^2$ for all *t*.

Note that because the conditional variances, σ_j^2, are different for every skill group, changes over time in the shares in each group (e.g. increased education levels or aging of the workforce) will also change the unconditional variance of unobserved skills.[8]

The residual variance of wages—which is what can be estimated in wage regressions—is given by taking variances of equation (2) – ignoring measurement error – and substituting in equation (5):

$$(6) \qquad Var(\varepsilon_{it}) = Var(p_t e_{it}) = Var(p_t) * Var(e_{it}) = p_t^2 \sum_j \theta_{jt} \sigma_j^2.$$

What we are interested in is how the price of unobserved skills, p_t, may have changed over time. A change in the residual variance of wages can only be interpreted as a change in the price of unobserved skills if the skill shares in the workforce, θ_{jt}, are held constant over time.

[7] This point was raised by Lemieux (2004) and is also explained by Card and DiNardo (2005).
[8] This is illustrated in Card and Dinardo (2005) for the simplest case, with just two skill groups.

Note again that the actual skill shares tend to change over time, as education levels increase and the workforce ages.

Some empirical papers ignore this problem, and treat changes in the residual variance of wages as being equivalent to changes in the price of unobserved skills. There are, however, multiple ways to correct for the problem. One way is to calculate the residual variance at counterfactual values of the shares θ_j^* that are held constant over time. We can rearrange (6) as follows:

(7) $$Var(\varepsilon_{it}) = \sum_j \theta_{jt}(p_t^2 \sigma_j^2)$$

If we hold the shares constant, the variance becomes the following:

(8) $$Var(\varepsilon_{it})^* = \sum_j \theta_j^*(p_t^2 \sigma_j^2)$$

The within-group variances, $p_t^2 \sigma_j^2$, can be computed for each skill group *j*, if the number of skills groups is small enough relative to the sample size that there are substantial numbers of observations in each skill group. The overall variance at the counterfactual shares can then be calculated, using shares either in the initial year, the final year, or the average of the two. The variance can be calculated using all three methods as a sensitivity test. Changes in this "counterfactual" variance provide an estimate of changes in the returns to unobserved skill.

A more convenient way to correct for composition changes is to re-weight the data for the purposes of calculating the residual variance so that the distribution and prices of observable skills at time *t+1* is identical to the distribution and price of skills at time *t*. The re-weighting procedure is in the spirit of Dinardo, Fortin, and Lemieux (1996) and is described in Lemieux (2002) and Lemieux (2004). The advantages to the re-weighting procedure are two-fold. First, it can be applied even when the data is divided into fine experience-education cells. Second, it provides a whole counterfactual wage distribution and thus makes it possible to compute measures of residual wage dispersion other than the variance, e.g. the ratios between different percentiles of the residual distribution.

It should further be noted that measurement error is an additional factor which may, if its extent changes over time, introduce a change in residual variance which is unrelated to unobserved skills or returns. We already mentioned the case of hyperinflation, where

measurement error most likely renders any analysis useless. Our solution to this problem is to consider years for comparison which are less affected by inflation. This is most relevant for the 1980s, where we consider 1980 and 1986 the most appropriate base years. Apart from that we have no means of analyzing if and how measurement error has changed over time in the EPH and thus assume it constant.

5. Data and Estimation Issues

The data used for this analysis is the household survey *Encuesta Permanente de Hogares* (EPH) of Argentina which has been carried out by Argentina's statistical office (INDEC) since 1972 and is used as the primary source of generating official unemployment rates. The survey includes comparable labor market information from 1980 through 2003 for the province of Gran Buenos Aires (GBA). The GBA sample encompasses the capital city of Buenos Aires and the surrounding Province of Buenos Aires. According to the Argentine Census, 46 percent of the Argentinean population lived in this area. As Argentina is mostly urban, trends observed in Buenos Aires are often considered representative for Argentina as a whole.

More urban centers of Argentina were later added to the sample over time, totaling 28 major provincial cities in the most recent incarnations of the survey. There is data with comparable coverage since 1992 for 16 main urban conglomerates in Argentina (henceforth ARG16). Until 2003, the survey was conducted on a semi-annual basis (May and October) before the questionnaire and methodology changed substantially.

We investigate the time series for GBA from 1980-2002, always using the October round of the survey[9]. For the wage analysis we focus on real hourly wages of workers with one single job only as reported in the EPH questionnaire[10]. To convert nominal wages into real wages we use INDEC's historic general consumer price index (IPC) for Gran Buenos Aires and deflate all values to constant October 2000 pesos.

[9] The May round of 2003 could be used to expand the data by another half a year, however in an analysis of variance this might be rather misleading due to seasonality effects on employment and wages. Data from INDEC clearly shows that there is considerably higher economic activity in May than in October.

[10] To avoid effects stemming from changes in the incidence of multiple-job holders this paper focuses on wages from the principal occupation, only. In order to do that one has to discard workers with more than one occupation in order to establish consistency of the data series over time. Before 1995, hourly wage data is only available for those workers with one single job. Even though this may be a minor point, to our knowledge this adjustment to guarantee consistency has not been done yet in any empirical research using EPH data.

To underline the explanatory power of the results from the smaller GBA sample, the decomposition analysis is also carried out using the ARG16 sample from 1992-2002 as a robustness check. For the analysis, the sample of urban centers is not continuously expanded to 28 cities as survey coverage increases over time. This is because changes in the survey's coverage can have substantial effects on the residual variance induced by geographical differences, which we cannot observe. This may be the case even if there are no important changes in the (observable) means. Regional variation in the ARG16 sample is accounted for by adjusting all incomes to the level of GBA, using a one-time comparison of price levels in 2001. This method effectively incorporates the assumption that relative regional price differences have not changed over time. However, due to the convertibility regime from 1991 to 2001 and the according price stability this assumption may be justified for most years of the ARG16 sample, yet arguable for later years.

Data inspection reveals a strong spike in all wage dispersion figures centered around 1989, the worst year of hyperinflation in Argentina (see Figures A1 and A2, appendix). Prices soared up to nearly 4000 percent annually, which led to the introduction of the Argentine currency board in April 1991. Measurement error is likely to be higher in times of high inflation, if people have to recall their earnings in an environment of constantly changing prices and wages. Second, during hyperinflation, prices and wages change monthly, weekly or even daily. Since surveys cannot be carried out at the same point in time for the whole sample, sequenced interviewing will introduce an upward bias to the wage variance in times of high price volatility and wage contract turnover.

Thus, the figures for the 1980s must be analyzed with caution. Using a base year with a bloated wage variance might lead to wrong conclusions of variance changes over time. What matters for the data quality from periods of high inflation is not only the yearly inflation but also the inflation figures from the month of interviewing. We use 1980 and 1986 as base years, as they were years of moderate inflation during both the whole year and in the survey month of October.

We apply the reweighing methodology to analyze changes in the residual variance over time against a base year by re-weighting the observations of the more recent year. The educational and demographic distribution of the Argentine labor force has changed noticeably since the 1980s. In particular, the overall improvement in educational attainment may have increased wage dispersion over time.

The decomposition is carried out in a stepwise fashion, following Lemieux (2002): first, a counterfactual wage distribution is generated, using the later year's observable skill distribution and the base year's estimated coefficients on observed skills. The difference between the inequality indicators of the final year and those of the counterfactual distribution can be attributed to changes in the returns to observed skills. In a second step, the counterfactual distribution is re-weighted in the above detailed fashion. The difference between inequality indicators of the two distributions is ascribed to changes in the skill distribution in the population. Finally, the difference between the distributional indicators of the base year and the counterfactual distribution using both, base year weights and returns, is the effect of changing returns to unobserved skills.[11]

6. Analysis of Wage Inequality in Gran Buenos Aires

Tables 5a, 5b, and 5c present variance decomposition results for men and women, for the total period 1980-2002, as well as 1980-1992 and 1992-2002, which correspond to two different economic policy regimes. Four measures of wage dispersion are depicted: the variance of log hourly wages, and the 90:10, 50:10 and 90:50 percentile ratios. The first three rows of each table show values in the base year and the final year, and the absolute changes. Rows four to six split up the change into three components and show how much of the overall change was caused by changes in each of the components: the returns to observed skills, the composition of observed skills in the workforce, and the returns to unobserved skills.

1980-1992

Between 1980 and 1992, wage dispersion decreased for both men and women (see Table 5b). For men, the variance of log wages dropped from 0.48 to 0.45 and the 90:10 ratio from 5.5 to 5.0. Improvements in the education level of the workforce tended to increase the overall variance of wages, due to the fact that groups of workers with higher education have higher within-group wage dispersion. On the other hand, decreases in the returns to observed skills tended to decrease in the overall variance. The overall effect of falling returns to high school education and falling returns to experience dominates the inequality-increasing effect of rising returns to college education, which only improves the wages of the college-educated minority

[11] Decomposition results switching the order of the first two steps are qualitatively similar to the base case and can be obtained from the authors upon request.

of the population. The results show that at the same time, decreasing returns to unobserved skill lowered inequality among men.

Figure 2 depicts the change in overall variance for men and women, and to what extent the change is a result of changes in the composition-adjusted residual variance.

In 1980, the male wage distribution showed a higher 50:10 than 90:50 ratio. This imbalance is increased in the 1980s as the 50:10 ratio falls (from 2.1 to 1.9) while the 90:50 ratio rises slightly (2.6 to 2.7). Composition effects, i.e., the increase in educated workers, increased inequality in the upper half. Changing returns to observed skills decrease inequality more in the upper half, mostly due to falling returns to experience. In contrast, the changes in the residual distribution decrease the 50:10 ratio more strongly, i.e., returns to unobserved skills affect the lower part of the distribution more.

For women, the variance fell from 0.47 to 0.34 and the 90:10 ratio from 5.1 to 4.1. The drivers of the decrease are the same as for men: composition effects contributed to an increase in wage variance which was counteracted by falling returns to observed skill, where lowered returns to higher education dominate the effect of rising returns to experience. At the same time, decreasing returns to unobserved skill also lowered inequality among women.

As for men, the changes of the 1980s increased the imbalance of the female distribution which has a higher inequality in the upper half: the 90:50 ratio fell less (2.4 to 2.3) than the 50:10 ratio (2.1 to 1.8). The reason is the stronger decrease in returns to unobserved skill in the lower half of the distribution. Composition effects increased the 90:50 more but changing returns to observed skills counteracted this effect: women in the labor market are on average more educated than male workers (see Table 2) but have less experience (Table 4), so they are overall more hurt by falling returns to education than helped by increasing returns to experience.

To sum up, the patterns of the 1980s are similar for men and women: between 1980 and 1992, a combination of falling or stagnant returns to higher education and changing returns to experience caused the between-group variance to decrease as the means of different education-experience groups moved closer together. Composition effects mainly refer to the educational upgrading of the workforce: as higher educational groups tend to have higher wage variances, improvements of educational attainment will increase the variance. The

results would suggest that the returns to unobserved skill decreased in the 1980s in Argentina, in line with returns to observed skills.

1992-2002

The 1990s show a substantially different picture from the 1980s (see Table 5c). Male wage variance increased strongly, from 0.45 to 0.68, and the 90:10 ratio jumped from 5.0 to 7.9. The strongest drivers of this increase were changes in the returns to observed skills. To a smaller degree, composition effects and changing returns to unobserved skill also contributed to the increase. Figure 3 shows to what extent changes in the variance can be explained by changes in the composition-adjusted residual.

For men, the 1990s also saw widening earnings inequality, measured both in terms of the 90:50 and 50:10 ratios. For changes to the 90:50 ratio, most of the inequality increase was due to changing returns to observed skill. The returns to university education grew much more than returns to secondary education, and the mean wage of the highly-educated is strongly shifted upwards. Also, returns to experience increased, favoring more experienced workers who already have a higher within-group variance. Composition effects played a much smaller role, and returns to unobserved skills decreased in the upper distribution half. On the contrary, in the lower half of the distribution, the changing returns to education explain only about 13 percent of the inequality increase. However, increasing returns to unobserved skills explain almost 80 percent of the increase in the 50:10 ratio. The contribution of the returns to unobserved skills to explain changes in the upper and lower half of the distribution are depicted in Figure 4.

For women, the variance of wages also increased between 1992 and 2002: from 0.34 to 0.65. The 90:10 ratio grew from 4.1 to 7.4. Composition effects played an almost negligible role for women, and were even slightly negative for the 90:10 ratio. Most of the variance growth was driven by increases in the returns to observed skills, followed by increases in the returns to unobserved skills.

The trends of the female wage distribution in the 1990s is very similar to that of men: inequality grew in both parts of the distribution, with the 50:10 ratio increasing from 1.8 to 2.6 while the 90:50 ratio grew from just 2.3 to 2.9. Increasing returns to higher education and experience played the main role in spreading the upper half of the distribution but no role in the lower half. Growing returns to unobserved skills strongly raised the lower half of the

distribution but had a negative effect on the upper half, as in the case of men. The contribution of the returns to unobserved skill to explain changes in the upper and lower half of the distribution are shown in Figure 5. As for the case of men, the graphical series underlines the considerable difference in both parts of the distribution.

The fact that composition effects of observed skills played only a small (or partly even negative) role is due to the fact that the within-group variances of experience-education groups (especially educational groups) converged considerably in the 1990s, mitigating the effect of skill-upgrading on the variance. As Tables 6 and 7 show, the variance between 1992 and 2002 increased within each experience group for men and women. Since the size of experience groups does not change drastically (Table 4), the composition effect with respect to these groups is small. On the other hand, the sizes of educational groups change much more over the course of the 1990s (Table 2). Here, the within-educational group variance increases strongest for workers with complete or incomplete primary education. This effect is especially strong within the female workforce. As these groups are shrinking in the population, the composition effects work towards decreasing the variance.

The decomposition shows that 1980s and 1990s, returns to education and to unobserved skills move in tandem. It thus seems plausible that both phenomena might be driven by the same underlying processes in the case of Argentina.

In line with the analysis, the changes observed for Argentina in the 1980s may have occurred via the technology channel. It does not seem likely that a form of 'negative technological change' was at work, the explanation may rather lie in the level of technology present, and the supply of and demand for skills: the 1980s were characterized by constant waves of crises and instability. Average GDP growth 1980-1990 was around minus one percent. Over the same period, capital formation was reduced by 50 percent in real terms.[12] There was certainly no positive technology shock during this period – most likely, the technological level was stable, if not decreasing due to lack of replacement and maintenance in times of crises. If, in line with educational upgrading, "technological skills" were improved in the population[13] and the stock of technology to operate deteriorated, we would expect increasing supply of, and falling demand for those skills and consequently falling returns.

[12] Own calculations based on World Development Indicators.
[13] Remember that we assume a stable distribution of unobserved skills, conditional on observed skills, in order to interpret changes in the residual as changes in the returns to unobserved skills.

The SBTC hypothesis predicts that technology shocks will spread the earnings distribution by increasing the returns to skills which are complementary with the technology. These skills should partly be reflected in educational attainment.[14] The relevant skills which are uncorrelated with education will also experience an increase in demand and in their returns. In the 1990s, the returns to both observed skills, especially university education, and unobserved skills worked strongly towards increasing the wage variance. As noted earlier in this paper, the literature on the United States shows that the returns to observed and unobserved skill have not grown at the same time, casting doubt on the hypothesis that SBTC is behind both changes. In Argentina, however, the two have evolved together. This is compatible with the hypothesis that SBTC is behind both sets of changes.

In the male and female wage distribution, increases in the variance occurred in both the upper and lower halves of the earnings distribution. The drivers, however, are fundamentally different. The increase in the 90:50 ratio is mostly caused by increasing returns to observed skills, especially college education, as college-educated individuals are concentrated in the highest deciles of the wage distribution. On the other hand, the returns to high school education did not increase strongly. As mostly workers with lower to middle education populate the lower half of the wage distribution, the effect of returns to education is weak in this part. Instead, the growth of the 50:10 can almost fully be explained by changes in the residual variance. This means that increasing returns to unobserved skills are the driver of the growth in dispersion between the median and the 1st decile. In other words, workers at the bottom and in the middle of the wage distribution must differ with respect to their unobserved skills in a way in which the middle does not differ from the top of the distribution.[15]

7. Informal-Formal Wage Gap

This section considers what relevance the findings for the return to unobserved skill may have for the earnings gap between formal and informal salaried workers.[16] One of the puzzles in

[14] This also means that they may be partially correlated with educational attainment. This will introduce a bias to the estimated coefficients to education which will partly reflect returns to unobserved skills.
[15] The same patterns with very similar magnitudes of change hold for the much bigger sample of 16 Argentinean urban conglomerates between 1992 and 2002. The results are shown in Table A2 of the appendix.
[16] The paper uses a three-way classification of employment: formal employees, informal employees, and independent workers. Independents are defined as the self-employed and those who are owners of micro-enterprises with 5 or fewer employees. Formality is defined in terms of worker benefits, specifically having the

Argentina is the long-term transformation of its workforce. In Gran Buenos Aires between 1980 and 2002, the fraction of all workers who are informal salaried workers more than doubled, from 15 to 32 percent, while the share of self-employed workers remained roughly constant at around 26 percent. The shift from formal to informal employment happened steadily over the whole period. Table 7 documents how this increase divides up between full-time and part-time workers. Even though most of the increase happens among part-time workers, it is also substantial among full-time workers, which are the object of analysis in this paper.

World Bank (2007) documents the evolution of informal employment in Argentina, exploring possible explanations for the steady increase in rates of informal employment over time. Possible causes include macroeconomic policy and privatization, economic structure and demographic change, trade and technological change, labor regulations and institutions, as well as tax evasion, enforcement and weak public confidence. In a simply supply and demand framework, decreasing wages in light of increasing demand for informal workers could be a natural result of large increases in the supply of informal workers. The most likely candidate explanation for such changes in supply would be changes to the labor market induced by structural or demographic changes, such as an augmented entering of women into the labor force. However, in separate analyses, Gasparini (2002) and World Bank (2007) find that structural and demographic changes cannot explain the increase in levels of informal employment. World Bank (2007) also shows that changes in the minimum wage and unionization are very unlikely candidates to explain the decreasing informal-formal wage gap. Additionally, changes in trade patterns since 1980 can explain only a small portion of increases in the size of informal salaried employment (Goni and Maloney, 2007).

Several hypotheses imply that high levels of informal employment are fundamentally driven by increased demand for informal work arrangements. Such an explanation would be paired most naturally with increased relative wages in the informal compared to the formal sector. However the wages of informal and self-employed workers relative to formal workers have not increased consistently. Between 1980 and 1992, relative wages of informals were indeed rising. However, Table 9 shows that in the 1990s, the relative wages of informal workers fell substantially, by approximately 21 percentage points for men and 26 percentage points for

right to receive a pension, which has been shown to be highly correlated with registration in the social security system. (World Bank 2007)

women. It is puzzling why relative informal wages fell at the same time that informal employment was stable or even expanding at high levels.

One possibility is that the growing gap between formal and informal salaried wages was driven by increased returns to education, given that formal workers on average are more educated. Table 8a and 8b show the educational structure of the employed population in Gran Buenos Aires and its evolution between 1980 and 2002. Formal workers have higher levels of completed secondary or higher education, compared to informal workers: e.g., in 1992 the comparison is 41 compared to 20 percent for men, and 61 to 29 percent for women.

As the group of formal and informal workers differs in their educational composition, and returns to education shifted over time, the combination of these phenomena might largely explain the changes in relative wages between the groups. We examine the degree to which the change in the relative wage gap can be explained by changes in the returns to education. In order to do that, we simulate a counterfactual wage distributions for 2001 by replacing the true returns to education (estimated coefficients on education dummies) that year with the returns in 1992. The Mincer equations that are used to estimate the returns and generate the simulated wage distributions include only education dummies and a quadratic in experience. We use the year 2001 as the final year in order to abstract from the short-term drop in returns to education that occurred during the economic crisis in 2002. The counterfactual wage distribution for 2001 using returns from 1992 shows that changes in the returns to education only explain 10 percent of the drop in relative wages for men. For women, changes in the returns play a bigger role and explain 41.5 percent of the drop in relative informal wages.

The decline in the relative wages of informal workers may be linked to the decline in the returns to unobserved skill. The analysis presented in the previous section shows that changes in the returns to unobserved skill affected chiefly earnings inequality below median wages, i.e. the 50:10 ratio. Table 10 shows that in both 1992 and 2002, informal workers were concentrated at the bottom of the wage distribution. Consequently, changes in the returns to unobserved skill are likely to have had a substantial effect on the gap between informal and formal wages.

Unfortunately, it's not possible to quantify the precise effect of changes in the returns to unobserved skill on the formal-informal wage gap, due to the fact that the distribution of unobserved skill between formals and informal workers is unknown and may have changed over time. This is particularly likely given the large expansion in informal work over time.

Note that the analysis of returns to unobserved skill presented in the previous section relies on the plausible assumption that within skill (education and experience) groups, the distribution of unobserved skill has not changed over time. Because of the potential for workers to move between formal and informal jobs, a similar assumption for formal and informal worker groups would not be tenable.

If, as these results suggest, the growing informal-formal gap has been driven by increases in the returns to unobserved skill, technical change may be the ultimate cause of some of the informal-formal dynamics. Changes in technology employed in formal salaried jobs may have increased the demand for workers with complementary skills. If these skills are unobserved in survey data (but observed by potential employers), those with unobserved skill may have been sorted into formal sector jobs, expanding the gap between informal and formal jobs, even while the share of informal employment has increased.

8. Conclusion

The variance decomposition analysis presented in this paper shows that that the returns to unobserved skill decreased in Argentina in the 1980s and then increased during the 1990s, during the same period that the returns to education increased. The changes in the 1980s are compatible with a stagnation of the level of technology in Argentina during the decade, paired with educational upgrading of the workforce. In other words, the drop in returns may reflect an increasing supply of those skills, combined with falling demand.

We interpret the simultaneous timing of the increase in the returns to unobserved skill and education in the 1990s as circumstantial evidence that skill-biased technical change is driving both phenomena. Demand for relevant skills outpaced the parallel increase in supply of those skills in the workforce with improved education.

The variance decomposition also demonstrated that in the 1990s the growth in the inequality of the upper half of the earnings distribution was mainly caused by rising returns to college education. In contrast, the growth in the inequality of the lower half of the distribution can mainly be explained by increasing returns to unobserved skills. This finding offers a possible explanation for the growth in the wage gap between informal and formal salaried workers in the 1990s. Competing explanations to SBTC do not seem to be able to explain these phenomena. Also, changing returns to education do not account for the changes in relative

wages. As the increase in the returns to unobserved skill has taken place largely between the median and the lower end of the distribution, where informal workers are concentrated, this could be interpreted as evidence that changes in the returns to unobserved skill have driven the relative drop in the wages of informal workers.

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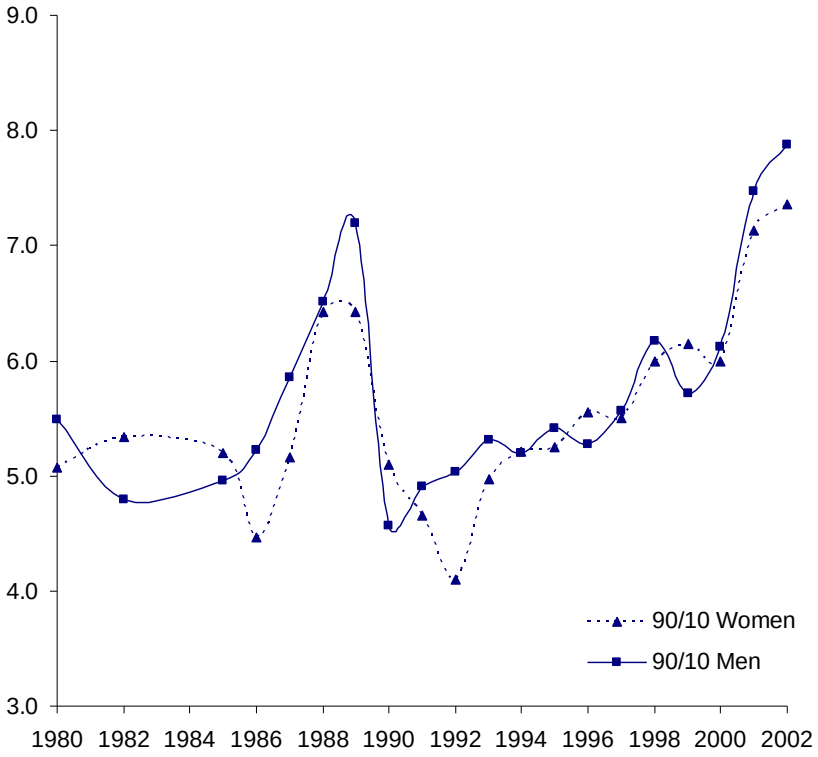
Figures

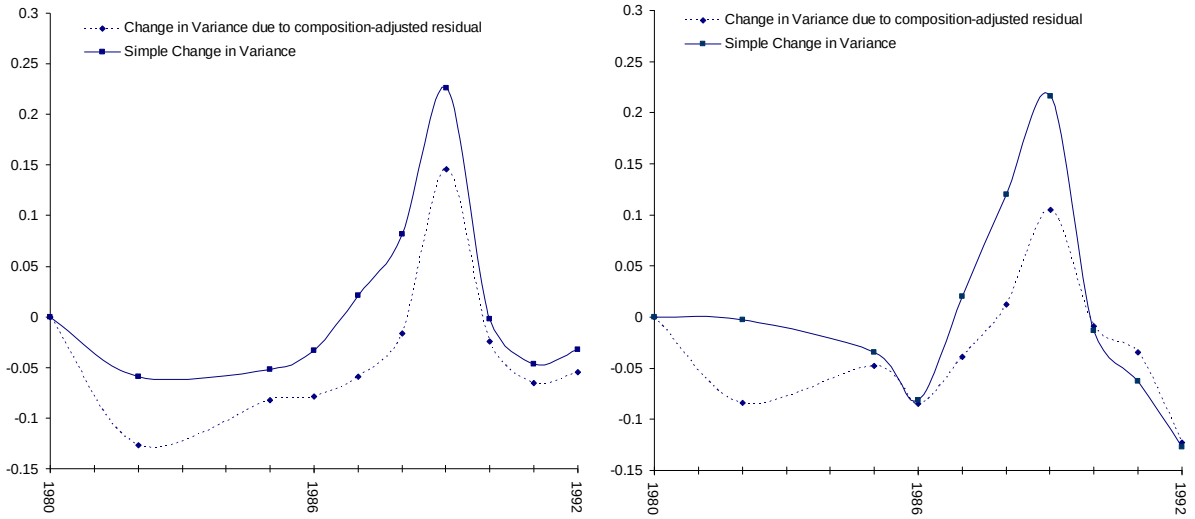
Figure 1. Earnings Inequality in Gran Buenos Aires: 90:10 Ratio



Source: Own estimates based on EPH survey data (GBA)
Note: Considered are hourly wages for full-time workers above age 15 with one occupation.

Figure 2. Change in Variance and Residual Variance, 1980-1992, Men and Women

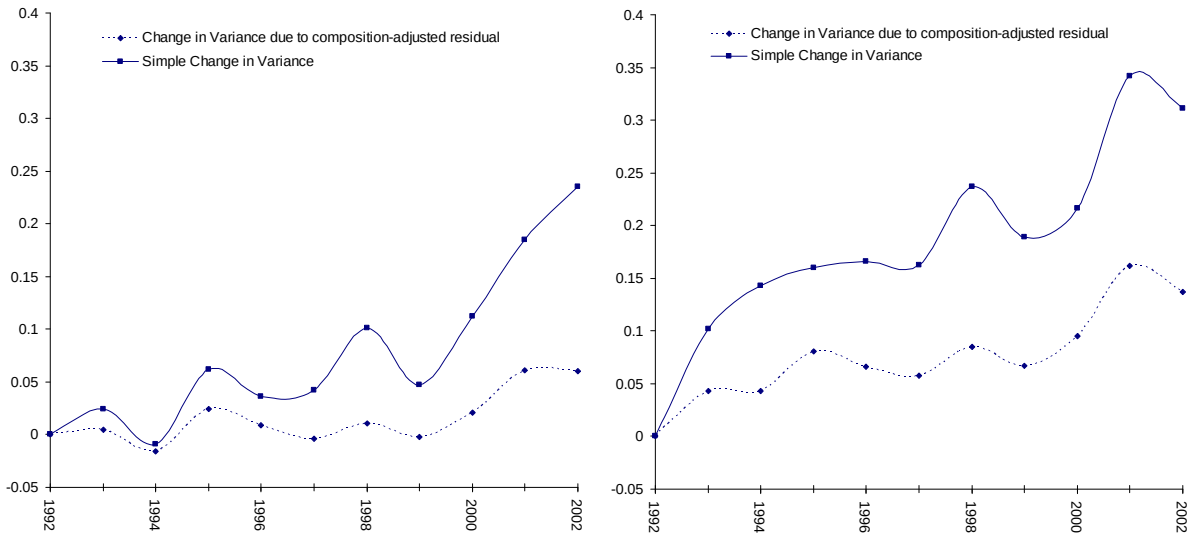
Men *Women*



Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

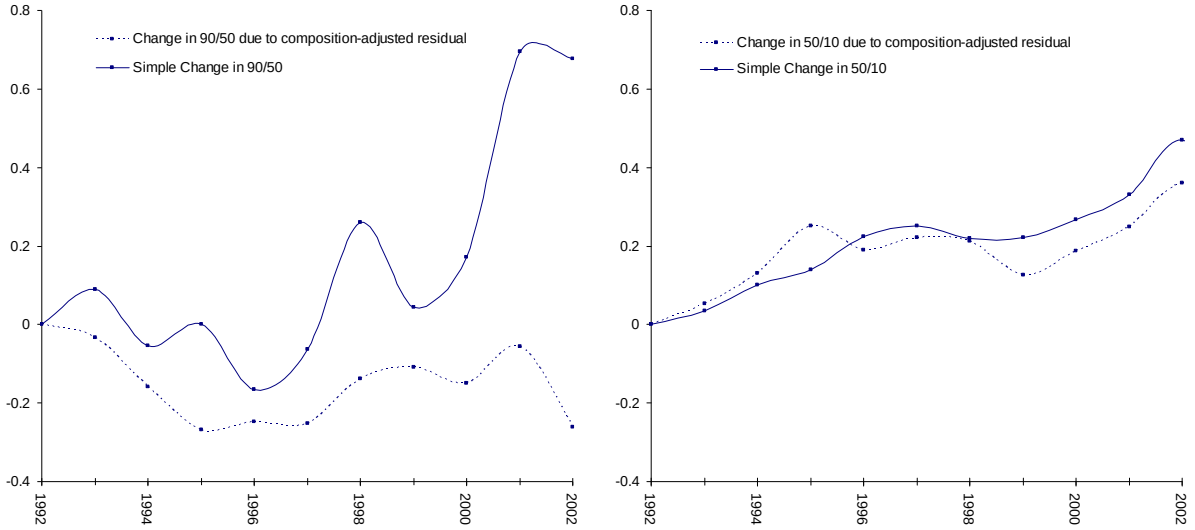
Figure 3. Change in Variance and Residual Variance, 1992-2002, Men and Women

Men *Women*



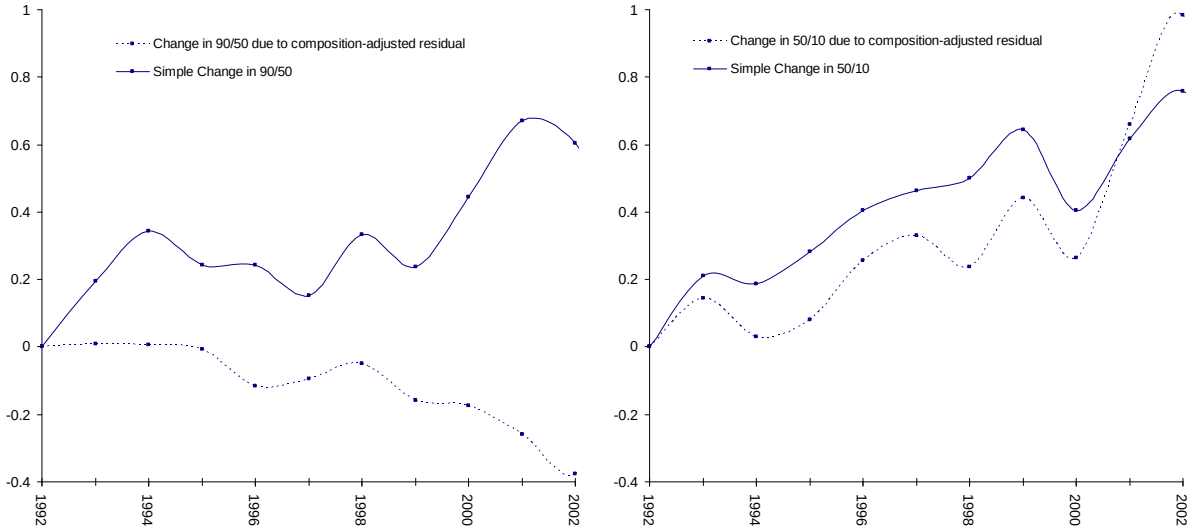
Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Figure 4. Change in 90:50 and 50:10-ratio, 1992-2002, Men



Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Figure 5. Change in 90:50 and 50:10-ratio, 1992-2002, Women



Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Tables

Table 1. Marginal Returns to Education Levels

	Marginal Effect of Education			
	MEN		**WOMEN**	
	Completed High School	Completed College	Completed High School	Completed College
1980	0.64	0.59	0.59	0.53
1986	0.52	0.70	0.54	0.45
1992	0.45	0.66	0.37	0.38
1998	0.47	0.98	0.66	0.69
2002	0.56	1.03	0.72	0.79

Source: Own estimates based on EPH survey data (GBA).
Note: Marginal returns to education are estimated by specifying standard Mincer wage regressions, in which the dependent variable is log hourly wages from principal occupations for adult full-time workers with one single job. Regressors include a quadratic in potential labor market experience and dummies for 6 six educational categories: incomplete and complete primary, high school and college education. The marginal returns to a completed college education are calculated compared to a completed high school education, and the marginal returns to a high school education, are calculated compared to completed primary education.

Table 2. Shares of Workers by Educational Groups (in Percent)

MEN	Primary Incomplete	Primary Completed	High School Incomplete	High School Completed	College Incomplete	College Completed	All
1980	19.7	37.7	19.3	11.1	6.8	5.4	*100.0*
1986	15.3	33.3	21.1	13.8	7.9	8.5	*100.0*
1992	9.1	33.4	21.8	17.8	8.6	9.4	*100.0*
1998	6.9	28.5	24.1	18.6	12.2	9.7	*100.0*
2002	6.2	23.3	22.6	19.4	13.4	15.0	*100.0*

WOMEN	Primary Incomplete	Primary Completed	High School Incomplete	High School Completed	College Incomplete	College Completed	All
1980	16.0	32.7	17.5	18.7	7.4	7.7	*100.0*
1986	13.8	28.5	18.0	21.6	8.2	9.8	*100.0*
1992	6.6	28.1	17.3	24.9	9.7	13.5	*100.0*
1998	5.4	20.7	17.4	24.1	15.8	16.6	*100.0*
2002	3.7	18.5	12.4	28.1	17.6	19.8	*100.0*

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 3. Returns to Labor Market Experience

		Coefficient on		Return to Experience Evaluated at		
	Year	Experience	Squared Experience	10 Years	20 Years	30 Years
MEN	1980	0.039	-0.00055358	0.384	0.769	1.153
	1992	0.035	-0.00049999	0.345	0.690	1.035
	2002	0.039	-0.00046859	0.385	0.771	1.156
WOMEN	1980	0.027	-0.00045122	0.265	0.531	0.796
	1992	0.031	-0.00052025	0.305	0.610	0.914
	2002	0.037	-0.0004366	0.366	0.731	1.097

Source: Own estimates based on EPH survey data (GBA)

Note: Returns to experience are estimated by specifying standard Mincer wage regressions, in which the dependent variable is log hourly wages from principal occupations for adult full-time workers with one single job. Regressors include a quadratic in potential labor market experience and dummies for 6 six educational categories: incomplete and complete primary, high school and college education.

Table 4. Shares of Workers by Groups of Years of Experience (in Percent)

MEN	[0 - 10)	[10 - 20)	[20 - 30)	≥ 30	All
1980	18.5	23.1	21.6	36.8	*100.0*
1986	17.4	25.2	22.9	34.6	*100.0*
1992	22.4	23.9	21.1	32.7	*100.0*
1998	21.7	23.4	22.3	32.6	*100.0*
2002	18.9	24.1	24.0	33.0	*100.0*

WOMEN	[0 - 10)	[10 - 20)	[20 - 30)	≥ 30	All
1980	30.6	23.1	18.9	27.4	*100.0*
1986	27.2	23.6	18.9	30.3	*100.0*
1992	29.9	19.0	23.7	27.5	*100.0*
1998	30.7	21.5	19.5	28.3	*100.0*
2002	28.2	23.7	20.9	27.1	*100.0*

Source: Own estimates based on EPH survey data (GBA)

Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 5a. Decomposition Results, 1980-2002

MEN	Var logwage	90/10	50/10	90/50
2002	0.684	7.882	2.361	3.338
1980	0.481	5.488	2.091	2.625
Change	0.203	2.394	0.271	0.713
Components of change:				
Δ Returns to Observed Skills	0.099	1.201	0.071	0.421
Δ Composition of Observed Skills	0.053	1.101	-0.095	0.578
Δ Returns to Unobserved Skills	0.051	0.092	0.295	-0.286
WOMEN	Var logwage	90/10	50/10	90/50
2002	0.649	7.361	2.577	2.856
1980	0.465	5.065	2.101	2.411
Change	0.183	2.296	0.476	0.445
Components of change:				
Δ Returns to Observed Skills	0.082	1.710	0.058	0.613
Δ Composition of Observed Skills	0.049	-0.181	-0.349	0.209
Δ Returns to Unobserved Skills	0.052	0.768	0.767	-0.377

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 5b. Decomposition Results, 1980-1992

MEN	Var logwage	90/10	50/10	90/50
1992	0.449	5.036	1.892	2.662
1980	0.481	5.488	2.091	2.625
Change	-0.032	-0.452	-0.199	0.037
Components of change:				
Δ Returns to Observed Skills	-0.040	-0.496	-0.084	-0.138
Δ Composition of Observed Skills	0.063	0.724	0.114	0.217
Δ Returns to Unobserved Skills	-0.055	-0.681	-0.229	-0.043
WOMEN	Var logwage	90/10	50/10	90/50
1992	0.338	4.102	1.820	2.253
1980	0.465	5.065	2.101	2.411
Change	-0.127	-0.963	-0.281	-0.157
Components of change:				
Δ Returns to Observed Skills	-0.094	-1.150	-0.180	-0.372
Δ Composition of Observed Skills	0.090	1.115	0.184	0.348
Δ Returns to Unobserved Skills	-0.123	-0.929	-0.285	-0.133

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 5c. Decomposition Results, 1992-2002

MEN	Var logwage	90/10	50/10	90/50
2002	0.684	7.882	2.361	3.338
1992	0.449	5.036	1.892	2.662
Change	0.235	2.846	0.469	0.676
Components of change:				
Δ Returns to Observed Skills	0.139	1.919	0.059	0.748
Δ Composition of Observed Skills	0.036	0.557	0.050	0.190
Δ Returns to Unobserved Skills	0.060	0.370	0.361	-0.262
WOMEN	Var logwage	90/10	50/10	90/50
2002	0.649	7.361	2.577	2.856
1992	0.338	4.102	1.820	2.253
Change	0.311	3.259	0.757	0.603
Components of change:				
Δ Returns to Observed Skills	0.175	2.328	-0.070	0.955
Δ Composition of Observed Skills	-0.002	-0.229	-0.156	0.024
Δ Returns to Unobserved Skills	0.137	1.161	0.983	-0.376

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 6. Variance of Log Wages by Education Group

MEN	Primary Incomplete	Primary Complete	High School Incomplete	High School Complete	College Incomplete	College Complete	Overall
1980	0.350	0.342	0.400	0.448	0.369	0.598	0.481
1992	0.284	0.272	0.331	0.396	0.413	0.550	0.449
2002	0.688	0.367	0.299	0.541	0.550	0.422	0.684
WOMEN	Primary Incomplete	Primary Complete	High School Incomplete	High School Complete	College Incomplete	College Complete	Overall
1980	0.338	0.311	0.404	0.289	0.336	0.596	0.465
1992	0.123	0.248	0.217	0.302	0.280	0.471	0.338
2002	0.275	0.617	0.457	0.364	0.279	0.460	0.649

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 7. Table 5. Variance of Log Wages by Experience Group

MEN	[0 - 10)	[10 - 20)	[20 - 30)	≥ 30	Overall
1980	0.368	0.458	0.509	0.523	0.481
1992	0.345	0.518	0.480	0.424	0.449
2002	0.637	0.643	0.799	0.649	0.684
WOMEN	[0 - 10)	[10 - 20)	[20 - 30)	≥ 30	Overall
1980	0.380	0.519	0.509	0.461	0.465
1992	0.267	0.323	0.451	0.317	0.338
2002	0.389	0.682	0.799	0.719	0.649

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 7. Changes in the Employment Structure

	Full-time Workers			Part-time Workers		
MEN	Self-Employed	Informal Salaried	Formal Salaried	Self-Employed	Informal Salaried	Formal Salaried
1980	27.3	11.5	61.2	36.4	19.4	44.2
1986	27.0	13.1	59.9	41.9	19.4	38.6
1992	28.4	18.6	53.0	35.1	32.4	32.5
1998	23.0	24.7	52.4	41.0	37.2	21.8
2002	26.8	23.3	49.8	38.6	42.8	18.5
WOMEN						
1980	20.0	16.8	63.2	35.8	27.5	36.7
1986	20.7	19.6	59.7	29.0	35.5	35.5
1992	21.9	24.2	53.9	31.0	33.0	36.0
1998	21.4	25.0	53.6	24.2	43.3	32.5
2002	19.1	24.1	56.7	20.8	50.7	28.6

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above. Full-time workers are those working 30 and more hours weekly.

Table 8a. Educational Composition of the Workforce, Men

Self-Employed	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	19.5%	36.9%	20.4%	8.7%	6.9%	7.5%
1986	13.2%	32.2%	23.3%	15.2%	5.9%	10.2%
1992	7.5%	36.7%	21.3%	17.6%	8.7%	8.3%
1998	8.5%	24.3%	23.7%	20.8%	9.4%	13.4%
2002	8.4%	25.6%	21.0%	17.8%	8.6%	18.7%
Informal Salaried	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	26.4%	41.1%	20.0%	8.1%	2.5%	1.9%
1986	22.4%	37.6%	24.5%	8.8%	4.5%	2.1%
1992	13.3%	38.5%	28.5%	11.2%	6.0%	2.5%
1998	10.0%	35.6%	28.5%	15.1%	7.2%	3.7%
2002	8.2%	28.6%	29.4%	18.2%	7.3%	8.4%
Formal Salaried	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	19.2%	37.8%	18.9%	12.3%	7.2%	4.7%
1986	15.2%	33.5%	19.6%	13.8%	9.2%	8.7%
1992	8.8%	30.3%	20.5%	19.4%	9.2%	11.9%
1998	5.2%	27.6%	22.9%	19.1%	15.3%	10.0%
2002	4.5%	20.8%	21.4%	20.8%	18.2%	14.2%
Employed Population	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	20.1%	37.9%	19.5%	10.8%	6.6%	5.2%
1986	15.6%	33.7%	21.2%	13.5%	7.7%	8.3%
1992	9.2%	33.6%	22.2%	17.4%	8.5%	9.1%
1998	7.1%	28.8%	24.4%	18.5%	11.9%	9.2%
2002	6.4%	23.9%	23.1%	19.4%	13.1%	14.1%

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 8b. Educational Composition of the Workforce, Women

Self-Employed	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	27.1%	36.3%	9.8%	14.6%	7.7%	4.4%
1986	23.5%	33.0%	13.8%	17.1%	3.7%	9.0%
1992	10.1%	35.9%	16.0%	23.1%	4.4%	10.5%
1998	11.0%	29.6%	21.2%	16.5%	7.2%	14.5%
2002	6.5%	37.2%	10.1%	25.1%	10.1%	11.1%
Informal Salaried	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	27.0%	44.3%	14.1%	7.9%	2.8%	3.8%
1986	21.1%	40.1%	22.7%	8.0%	5.6%	2.6%
1992	10.7%	36.7%	24.0%	17.9%	7.0%	3.7%
1998	8.5%	29.3%	19.1%	23.5%	11.4%	8.3%
2002	7.9%	22.8%	22.7%	18.3%	22.6%	5.6%
Formal Salaried	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	9.8%	28.4%	20.9%	22.7%	8.4%	9.7%
1986	8.2%	23.4%	18.0%	27.7%	10.5%	12.2%
1992	3.5%	21.1%	14.9%	28.7%	12.7%	19.2%
1998	1.9%	13.5%	15.3%	27.6%	20.9%	20.9%
2002	1.0%	10.5%	8.5%	33.5%	18.1%	28.5%
Employed Population	Primary Incomplete	Primary Complete	Secondary Incomplete	Secondary Complete	Tertiary Incomplete	Tertiary Complete
1980	16.2%	32.6%	17.5%	18.6%	7.3%	7.7%
1986	13.9%	28.7%	18.1%	21.6%	8.1%	9.6%
1992	6.7%	28.1%	17.3%	24.9%	9.5%	13.5%
1998	5.5%	20.9%	17.5%	24.2%	15.6%	16.4%
2002	3.7%	18.5%	12.2%	28.2%	17.7%	19.7%

Source: Own estimates based on EPH survey data (GBA)
Note: Population considered are single-job workers age 15 and above, working 30 and more hours weekly

Table 9: Effect of Returns to Education on Relative Wage Ratios

		Mean Earnings Ratio in 1992	Mean Earnings Ratio in 2001	Simulated Mean Earnings Ratio in 2001 with 1992-coefficients	Percent Change Explained By Change in Coefficients
Informal / Formal	Men	0.77	0.56	0.58	10.1%
	Women	0.77	0.51	0.62	40.7%
Self-employed / Formal	Men	1.15	0.86	0.85	-2.1%
	Women	0.98	0.49	0.59	20.6%

Source: Own estimates based on EPH survey data (GBA)
Note: Column four denotes to which degree the change in the relative wage gap can be explained by changes in the returns to education. In order to do that, we simulate a counterfactual wage distribution for the year 2001 by replacing the true returns to education (estimated coefficients on education dummies) that year with the returns in 1992. The Mincer equations that are used to estimate the returns and generate the simulated wage distributions include only education dummies and a quadratic in experience.

Table 10: Share of Workers in Deciles of the Wage Distribution By Occupational Category, 1992 and 2002

	MEN	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	All
1992	Self-Employed	7.9	6.2	4.4	7.1	8.8	9.1	9.6	14.3	13.4	19.3	*100.0*
	Informal Salaried	15.4	12.6	14.2	11.1	9.9	10.0	10.3	5.0	5.6	5.9	*100.0*
	Formal Salaried	9.1	10.7	11.0	10.9	10.6	10.4	10.1	9.9	10.1	7.3	*100.0*
2002	Self-Employed	16.3	7.6	9.0	8.9	6.5	13.3	7.3	7.7	9.1	14.2	*100.0*
	Informal Salaried	19.2	20.3	16.3	11.3	7.8	5.7	6.0	3.9	4.2	5.3	*100.0*
	Formal Salaried	2.4	6.2	7.4	10.0	12.8	10.4	13.3	14.1	13.2	10.1	*100.0*
	WOMEN	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	All
1992	Self-Employed	15.9	6.2	8.8	7.6	5.1	9.5	10.2	8.9	5.3	22.3	*100.0*
	Informal Salaried	13.4	10.6	10.3	14.9	11.2	11.2	8.8	6.5	5.7	7.4	*100.0*
	Formal Salaried	6.8	11.0	10.2	8.8	11.1	9.7	10.4	11.7	13.2	7.1	*100.0*
2002	Self-Employed	31.2	15.0	6.3	9.2	4.7	3.7	4.7	8.3	3.9	13.0	*100.0*
	Informal Salaried	13.5	18.3	9.4	15.4	9.9	12.1	12.0	3.1	3.5	2.7	*100.0*
	Formal Salaried	1.8	4.8	11.4	7.9	11.7	11.1	10.8	13.5	14.7	12.2	*100.0*

Source: Own estimates based on EPH survey data (GBA)

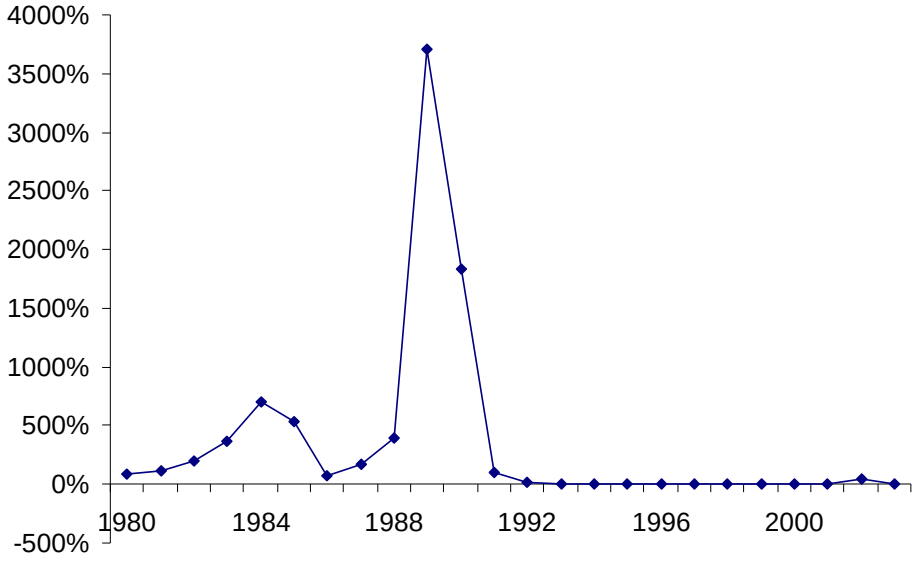
Appendix

Table A1. Decomposition Results, 1992-2002, ARG16 Sample

MEN	Var logwage	90/10	50/10	90/50
2002	0.661	7.598	2.495	3.045
1992	0.457	5.224	1.983	2.635
Change	0.204	2.374	0.513	0.410
Components of change:				
Δ Returns to Observed Skills	0.092	1.248	0.092	0.402
Δ Composition of Observed Skills	0.024	0.482	0.057	0.141
Δ Returns to Unobserved Skills	0.088	0.644	0.364	-0.134
WOMEN	Var logwage	90/10	50/10	90/50
2002	0.658	7.576	2.840	2.668
1992	0.374	4.436	1.940	2.286
Change	0.284	3.141	0.900	0.382
Components of change:				
Δ Returns to Observed Skills	0.136	1.799	0.139	0.529
Δ Composition of Observed Skills	0.007	-0.115	-0.070	0.012
Δ Returns to Unobserved Skills	0.141	1.456	0.830	-0.159

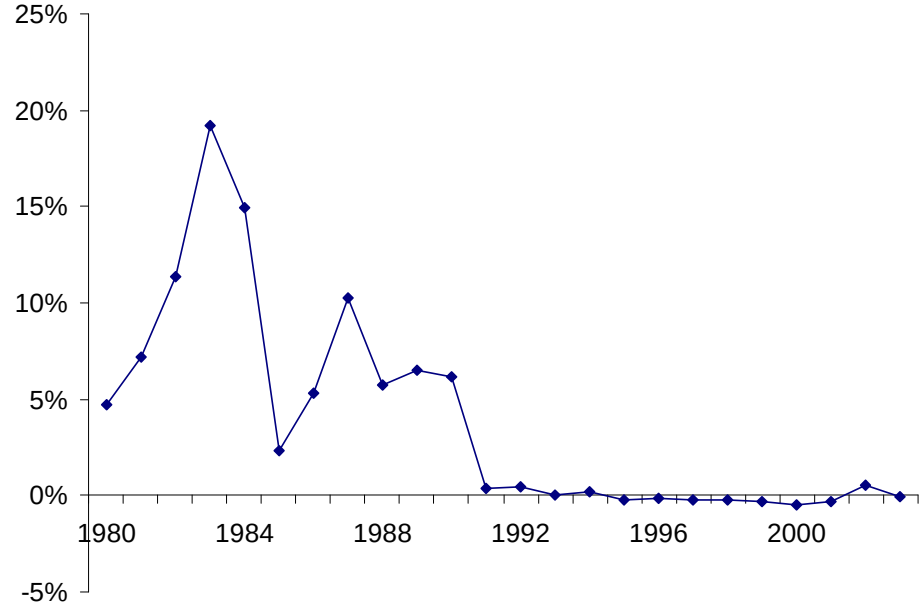
Source: Own estimates based on EPH survey data (ARG16)

Figure A1. Yearly Inflation



Source: INDEC CPI

Figure A2. Inflation in October



Source: INDEC CPI